भारतीय मानक
Indian Standard

IS 17017 (Part 24) : 2021

विद्युतीय वाहन चालकता चार्जिंग पद्धति

भाग 24 डी सी चार्जिंग के नियंत्रण के लिए विद्युतीय वाहन एवं विद्युतीय वाहन प्रदाय उपकरण के बीच अंकीय संचार

Electric Vehicle Conductive Charging Systems

Part 24 Digital Communication between a DC Electric Vehicle Supply Equipment and an Electric Vehicle for Control of DC Charging

ICS 43.120

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Electrotechnology in Mobility Sectional Committee, ETD 51

NATIONAL FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Electrotechnology in Mobility Sectional Committee had been approved by the Electrotechnical Division Council.

This standard provides guidance to Industry for setting up charging stations and to the electric vehicle manufactures to prepare the vehicles to charge the batteries, from these charging stations.

Considerable assistance has been obtained from IEC 61851-24 Edition 2 CDV while preparing this standard. This standard corresponds to the requirements of IEC 61851-24 Edition 2 CDV in the requirements it contains, but certain modifications have been done in relation to the cross referred standards, included content, and ambient conditions.

The cross references of IEC have been modified to refer Indian Standards wherever available. Where corresponding Indian Standards are not available, the IEC references have been retained. The committee has decided that these IEC standards are suitable to be used till equivalent/corresponding Indian Standards are published.

The committee had agreed to inclusion of System A and System C defined in IEC standards, and as such the references to other types and systems have not been retained. The ambient temperature has been modified, and system voltages aligned as per IS 12360.

This standard is to be read in conjunction with IS 17017 (Part 23).

The composition of the committee responsible for formulation of this standard is given at Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM

PART 24 DIGITAL COMMUNICATION BETWEEN A DC ELECTRIC VEHICLE SUPPLY EQUIPMENT AND AN ELECTRIC VEHICLE FOR CONTROL OF DC CHARGING

1 SCOPE

1.1 This standard (Part 24) applies to digital communication between a DC EV supply equipment and an electric road vehicle (EV) for control of conductive DC power transfer, with a rated supply voltage up to 1 000 V AC or up to 1 500 V DC and a rated output voltage up to 1 500 V DC.

1.2 This part also applies to digital communication between the DC EV charging/discharging station and the EV for System A, as specified in Annex A.

1.3 The EV charging mode specified is mode 4, according to IS 17017 (Part 23).

1.4 Annex A and Annex C give descriptions of digital communications for control of DC charging specific to DC EV charging system A and system C as defined in IS 17017 (Part 23).

2 REFERENCES

The following standard contains provisions, which through reference in this text constitute provisions of the standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

Other Publication	*Title*
ISO 11898-1 : 2003	Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signaling
ISO 11898-2 : 2003	Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit
ISO 15118-1	Road vehicles — Vehicle to grid communication interface — Part 1: General information and use-case definition
ISO 15118-2	Road vehicles — Vehicle to grid communication interface — Part 2: Network and application protocol requirements
ISO 15118-3	Road vehicles — Vehicle to grid communication interface — Part 3: Physical and data link layer requirements
IS 17017 (Part 1) : 2018	Electric Vehicle Conductive Charging System — Part 1: General
IS 17017 (Part 23) : 2021	Electric Vehicle Conductive Charging System — Part 23: d.c. Electric Vehicle Supply Equipment

3 TERMS AND DEFINITIONS

3.1 Digital Communication — Digitally encoded information exchanged between a DC EV supply equipment and an EV, as well as the method by which it is exchanged.

3.2 Parameter — Single piece of information relevant to charging control, and that is exchanged between a DC EV supply equipment and an EV using a form of digital communication.

3.3 Signal — A data element that is communicated between a DC EV supply equipment and an EV using any means other than digital communication.

4 SYSTEM CONFIGURATION

The system configuration shall be in accordance with F-1.2 of IS 17017 (Part 23) : 2021.

5 DIGITAL COMMUNICATION ARCHITECTURE

In this standard, two digital communication architectures are used:

a) based on CAN using a dedicated data communication circuit; CAN protocol is given in ISO 11898-1. Refer to Annex A for specific implementation details.

b) based on Homeplug® Green PHY™ (*see* IEEE 1901) over the control pilot line; refer to Annex C for specific implementation details.

6 CHARGING CONTROL PROCESS

F-1.3 of 17017 (Part 23) : 2021 provides general information on the charging process and the state of DC EV supply equipment.

Specific requirements of charging process are given in **A-4** and **A-6.3** for System A and **B-3** for System C of 17017 (Part 23) : 2021 respectively.

7 OVERVIEW OF CHARGING CONTROL

The digital communication of DC charging control covered by this standard is as shown in Fig. 1. This document does not cover the control protocol internal to the DC EV supply equipment, nor the vehicle, such as power control protocol for AC/DC inverter of DC EV supply equipment and battery management control in the vehicle.

8 EXCHANGED INFORMATION FOR DC CHANRGING CONTROL

This clause describes information which shall be exchanged between a DC EV supply equipment and a vehicle during the charging process according to IS 17017 (Part 23). The information in Table 1 is common to all systems described in Annex A and Annex C. Each information listed in Table 1 is defined as a parameter in each annex. Each system may need additional parameters, and these parameters are defined in each annex.

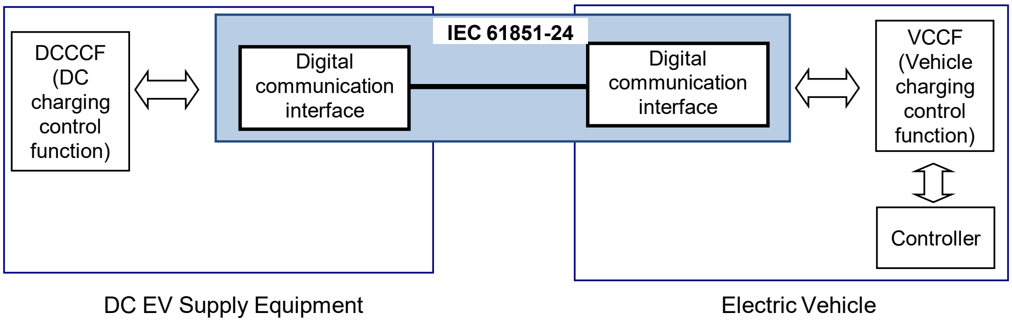

DCCCF (DC charging control function)
IEC 61851-24
Digital communication interface
Digital communication interface
VCCF (Vehicle charging control function)
Controller
DC EV Supply Equipment
Electric Vehicle

FIG. 1 DIGITAL COMMUNICATION BETWEEN A DC EV SUPPLY EQUIPMENT AND AN ELECTRIC VEHICLE FOR CONTROL OF DC CHARGING

Table 1 Exchanged Information for DC Charging Control

(*Clause* 8)

Sl No.	Information	Description	Relevant Requirement in 17017 (Part 23) : 2021
a-1	Current request for the controlled current charging (CCC) system	Exchange of current value requested by EV	**6.3.1.101**
a-2	Voltage request for the controlled voltage charging (CVC) system	Exchange of voltage value requested by EV	
a-3	Maximum rated voltage of DC EV supply equipment	Exchange of maximum rated voltage value of DC EV supply equipment	**6. 3.1.101** **6. 3.1.104**
a-4	Maximum rated current of DC EV supply equipment	Exchange of maximum rated current value of DC EV supply equipment	**6. 3.1.101** **6. 3.1.104**
b-1	Communication protocol	Exchange of software version of a charging system	**6. 3.1.104** **6. 3.1.106**
b-2	Maximum voltage limit of EV	Exchange of maximum voltage limit value of vehicle.	
b-3	EV minimum current limit, only for the controlled voltage charging (CVC) system	Under consideration	
b-4	Implementation of optional control function	Exchange information about available optional function, such as high current control and dynamic control.	**6.3.1.104** **6.3.2.102**
c	Insulation check result	Exchange of the result of insulation check before charging - If insulation check fails, a signal is sent that charging is not allowed.	**6. 3.1.105**
d	Short circuit test before charging	Exchange of information on short circuit test before charging	**6.3.1.109**
e	Charging stopped by user	Exchange of information on charge stop command by the user of DC EV supply equipment	**6.3.1.110**
f	EV supply equipment real time available load current (optional)	Exchange of EV supply equipment real time available load current for demand management. Required for system providing that function.	**6.3.2.102**
g	Loss of digital communication	Detection of loss of digital communication - If a receiver does not get information expected to receive within time out period, it is considered as loss of digital communication.	**9.101**
h-1	Zero current confirmed	Notification of zero current confirmed - Station informs EV that low current condition has been met (to allow the opening and welding check of EV contactors by EV)	**6.3.1.107** **F-1.3.4**
h-2	Welding detection	Exchange of information on the whole process of welding detection	
i-1	Normal shutdown	Termination of the charging process not caused by a failure	**6.3.1.115**
i-2	Error shutdown	Termination of the charging process caused by a failure	**6.3.1.116**

ANNEX A

(*normative*)

DIGITAL COMMUNICATION FOR CONTROL OF DC EV CHARGING SYSTEM A

A-1 GENERAL

This annex shows the specification of digital communication for control of the DC EV supply equipment of system A (in this annex, referred to as “System A station” or “station”) as specified in Annex A of IS 17017 (Part 23) : 2021. More detailed information on System A is defined in IEEE 2030.1.1.

This annex is also applicable to the DC EV charging/discharging station of System A.

A-2 DIGITAL COMMUNICATION ACTIONS DURING CHARGING CONTROL PROCESS

The communication actions and parameters according to the charging control process as defined in Table 31 of IS 17017 (Part 23) : 2021 are shown in Table A-1.

A-3 DIGITAL COMMUNICATION OF DC CHARGING CONTROL

The parameters for digital communication of DC charging control shall be exchanged according to the sequence diagram as shown in Fig. A-1.

A-4 PARAMETER DEFINITION

The definition of parameters during DC charging control process are shown in Table A-2 and Table A-3. Table A-2 and Table A-3 include the mandatory parameters and the optional parameters. The optional parameters are applied to the optional charging functions, such as dynamic control (*see* **A-7.3** of IS 17017 (Part 23) : 2021) and charging with thermal management system (*see* **A-9** of IS 17017 (Part 23) : 2021). The optional charging functions may be used when the station and the vehicle confirm the availability, specification and compatibility of functions by exchanging the optional parameters each other.

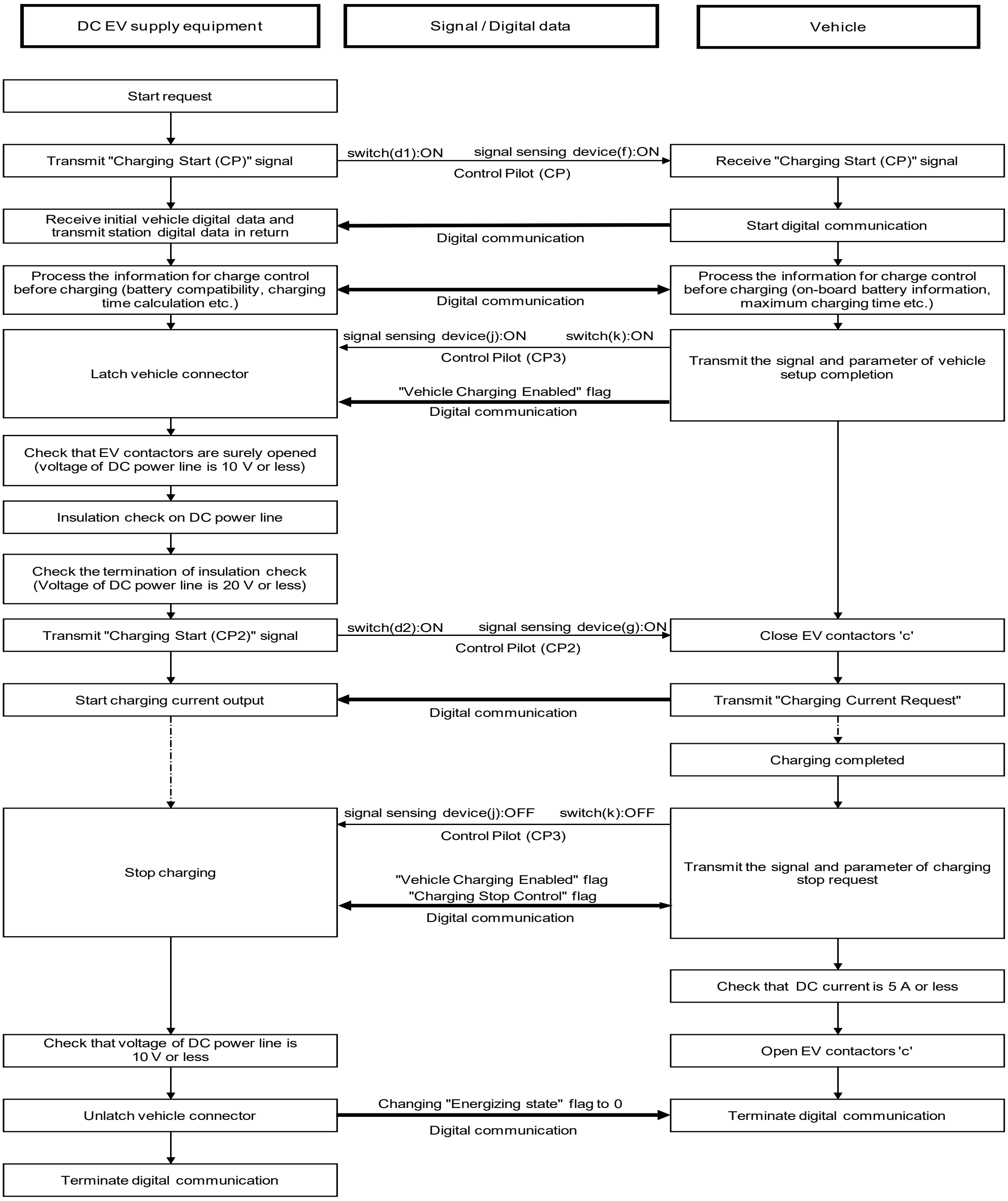
Table A-1 Communication Actions and Parameters during DC Charging Control Process between System A Station and Vehicle

Charging Control Stage		State	High Level Action at System Level a	Digital Communication Action	Parameter	
					From DC EV Supply Equipment	From Vehicle
Initialization	Handshaking	DC-A	Vehicle unconnected	None	N/A	N/A
		DC-B1	Connector plugged in	None	N/A	N/A
		DC-B1	Wake up of DCCCF and VCCF	None	None	(default CAN)
			Communication data initialization	Preparation for digital communication	(default CAN)	(default CAN)
		DC-B1→DC-B2	Communication established, parameters exchanged, and compatibility checked	Exchange of charging control parameters	– Control protocol number – Available output voltage – Available output current – Battery incompatibility – Energizing state – Identifier of welding detection – Threshold voltage – Charging stop control	– Control protocol number – Total capacity of battery – Maximum battery voltage – Maximum charging time – Target battery voltage – Vehicle charging enabled – Minimum charge current – Estimated charging time – Vehicle status – Charged rate
	Charge preparation	DC-B2 →DC-B3	Connector latched	Notification of state of charging progress	– Energizing state	None
		DC-B3	Insulation check for DC power line	None	Charging system error	None
		DC-B3	Pre-charge (depending on the system architecture)	N/A	N/A	N/A
Energy transfer		DC-C or DC-D	Vehicle side contactors closed	Notification of vehicle main contactor closed status	None	Vehicle status
		DC-C or DC-D	Charging by current demand (for CCC)	Notification of request value of charging current (or voltage)	– Station status – Output voltage – Output current – Remaining charging time – Station error – Charging system error – Charging stop control	– Charging current request – Charging system error – Parking status of the vehicle
		DC-C or DC-D	Charging by voltage demand (for CVC)	N/A	N/A	N/A
		DC-C,(D) →DC-B'1	Current suppression	Request of energy transfer shut-off	– Station status – Charging stop control – Output voltage – Output current	Vehicle charging enabled

Table A-1 (*Concluded*)

Charging Control Stage	State	High Level Action at System Level [a]	Digital Communication Action	Parameter	
				From DC EV Supply Equipment	From Vehicle
Shutdown (case 1)	DC-B'1	Zero current confirmed	Notification of energy transfer shut-off	– Station status – Charging system error	
	DC-B'1→ DC-B'2	Welding detection (by vehicle)		None	None
	DC-B'2	Vehicle side contactors open	None	None	Vehicle status
	DC-B'2	DC power line voltage verification	Notification of present voltage	Output voltage Energizing state	None
	DC-B'3	Connector unlatched	Notification of connector unlatch status	None	None
	DC-B'4	End of charge at communication level	Terminate the digital communication	None	None
	DC-A	Connector unplugged		N/A	N/A
Shutdown (case 2)	DC-B'1	Zero current confirmed	Notification of energy transfer shut-off	– Station status – Charging system error	
	DC-B'1→ DC-B'2	Welding detection (by vehicle)		None	None
	DC-B'2	Vehicle side contactors open	None	None	Vehicle status
	DC-B'2	DC power line voltage verification	Notification of present voltage	Output voltage Energizing state	None
	DC-B'3-1	Connector remain latched	Notification of connector unlatch status	None	None
	DC-B'4-1	End of charge at communication level	Terminate the digital communication	None	None
	DC-B'4-2	Connector unlatched or remain latched		N/A	N/A
	DC-A or DC-B1	Connector unplugged or remain plugged in		N/A	N/A

[a] The order of actions does not refer to the procedure of charging control process.


DC EV supply equipment
Signal / Digital data
Vehicle
Start request
Transmit "Charging Start (CP)" signal
switch(d1):ON
signal sensing device(f):ON
Control Pilot (CP)
Receive "Charging Start (CP)" signal
Receive initial vehicle digital data and transmit station digital data in return
Digital communication
Start digital communication
Process the information for charge control before charging (battery compatibility, charging time calculation etc.)
Digital communication
Process the information for charge control before charging (on-board battery information, maximum charging time etc.)
Latch vehicle connector
signal sensing device(j):ON
switch(k):ON
Control Pilot (CP3)
"Vehicle Charging Enabled" flag
Digital communication
Transmit the signal and parameter of vehicle setup completion
Check that EV contactors are surely opened (voltage of DC power line is 10 V or less)
Insulation check on DC power line
Check the termination of insulation check (Voltage of DC power line is 20 V or less)
Transmit "Charging Start (CP2)" signal
switch(d2):ON
signal sensing device(g):ON
Control Pilot (CP2)
Close EV contactors 'c'
Start charging current output
Digital communication
Transmit "Charging Current Request"
Charging completed
Stop charging
signal sensing device(j):OFF
switch(k):OFF
Control Pilot (CP3)
"Vehicle Charging Enabled" flag
"Charging Stop Control" flag
Digital communication
Transmit the signal and parameter of charging stop request
Check that DC current is 5 A or less
Check that voltage of DC power line is 10 V or less
Open EV contactors 'c'
Unlatch vehicle connector
Changing "Energizing state" flag to 0
Digital communication
Terminate digital communication
Terminate digital communication

NOTE — For symbols, see Table 17 of IS 17017 (Part 23) : 2021.

FIG. A-1 SEQUENCE DIAGRAM OF DC CHARGING CONTROL COMMUNICATION FOR SYSTEM A

Table A-2 Exchanged Parameter during DC Charging Control Process from Vehicle to System A Station

(*Claus*e A-4)

CAN ID (H’)	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min		Max	Item in Table1	Status flag
100	100	8	0	0-7	Minimum charging current	The minimum current value to conduct charging.	U	A	1	0	0		254	a-1	–
			1-3	0-7	–	–	–	–	–	–	–		–	–	–
			4	0-7	Maximum battery voltage	The maximum voltage value at the vehicle inlet terminals, at which the station stops charging to protect the vehicle battery	U	V	1		0		1200	b-2	–
			5	0-7											
			6	0-7	Constant of charging rate indication	Fixed value for charging rate indication, which is the maximum charging rate (100 percent) of vehicle battery	U	-	1	100	0		255	b-2	–
			7	0-7	–	–	–	–	–	–	–		–	–	–
101	100	8	0	0-7	–	–	–	–	–	–	–		–	–	–
			1	0-7	Maximum charging time (set by 10 s)	Maximum charging time permitted by EV, set by 10 s	U	s	10	0	0		2540	b-2	–
			2	0-7	Maximum charging time (set by 1 min)	Maximum charging time permitted by EV, set by minute	U	min	1	0	0		255	b-2	–
			3	0-7	Estimated charging time (set by 1 min)	Estimated remaining time before the end of charging calculated by EV	U	min	1		0		254	b-2	–
			4	0-7	–	–	–	–	–	–	–		–	–	–
			5	0-7	Rated capacity of battery	Rated capacity of battery	U	kWh	0.1		0		6553.5	b-2	–
			6												
			7	0-7	–	–	–	–	–	–	–		–	–	–

Table A-2 (*Continued*)

ID (H’)	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table1	Status flag
102	100	8	0	0-7	Control protocol number	Software version of control sequence to which EV corresponds	U	–	1		0	255	b-1	–
			1	0-7	Target battery voltage	Targeted charging voltage at the vehicle inlet terminals	U	V	1		0	1200	b-2	–
			2	0-7										
			3	0-7	Charging current request	Current value requested by EV during charging	U	A	1	0	0	200	a-1	–
			4	0	Battery overvoltage	Status flag indicating whether or not the vehicle battery voltage exceeds the maximum limit specified by EV	–	–	1	0	0	1	i-2	0: normal 1: fault
				1	Battery undervoltage	Status flag indicating whether or not the vehicle battery voltage is less than the lower limit specified by EV	–	–	1	0	0	1	i-2	0: normal 1: fault
				2	Battery current deviation error	Status flag indicating whether or not the output current deviates from EV requested current	–	–	1	0	0	1	i-2	0: normal 1: fault
				3	High battery temperature	Status flag indicating whether or not the temperature of vehicle battery exceeds the maximum limit	–	–	1	0	0	1	i-2	0: normal 1: fault
				4	Battery voltage deviation error	Status flag indicating whether or not the vehicle battery voltage deviates from the output voltage measured by the station	–	–	1	0	0	1	i-2	0: normal 1: fault
				5-7	–	–	–	–	–	–	–	–	–	–

Table A-2 (*Continued*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table1	Status flag
102	100	8	5	0	Vehicle charging enabled	Status flag indicating charge permission status of EV	–	–	1	0	0	1	i-1	0: disabled 1: enabled
				1	Parking status of the vehicle	Status flag indicating the parking status of the vehicle	–	–	1	0	0	1	i-1	0: vehicle in parking position 1: vehicle not in parking position
				2	Charging system error	Status flag indicating a malfunction caused by EV or the station, and detected by EV	–	–	1	0	0	1	i-2	0: normal 1: fault
				3	Vehicle status	Status flag indicating the EV contactor status	–	–	1	1	0	1	h-2	0: EV contactor closed or during welding detection 1: EV contactor open or welding detection finished
				4	Normal stop request before charging	Status flag indicating the request of EV to stop charging control	–	–	1	0	0	1	i-1	0: no request 1: request to stop
				5-7	–	–	–	–	–	–	–	–	–	–
			6	0-7	Charging rate	Charging rate of battery	U	%	1		0	100	a-1	–
			7	0-7	–	–	–	–	–	–	–	–	–	–

Table A-2 (*Concluded*)

Optional parameters													
ID (H')	**Period (ms)**	**DLC**	**Byte**	**Bit**	**Parameter**	**Content**	**Signed or Unsigned**	**Unit**	**LSB**	**Initial**	**Min**	**Max**	**Item in Table1**	**Status flag**
100	100	8	2 3	0-7	Minimum battery voltage	The minimum voltage value at the vehicle inlet terminals, at which the station stops discharging to protect the vehicle battery.	U	V	1		0	1200	b–2	–
110	100	8	0	0	Dynamic control	Flag indicating vehicle that is compatible with dynamic control.	–		1	0	0	1		0: Incompatible 1: Compatible
				1	High current control	Flag indicating vehicle that is compatible with high current control.	–		1	0	0	1		0: Incompatible 1: Compatible
				2	High voltage control	Flag indicating vehicle that is compatible with high voltage control.	–		1	0	0	1		0: Incompatible 1: compatible
				2-7	–	–	–	–	–	–	–	–	–	–
			1-2	0-7	Request charging current (extended)	Current value that vehicle requests the station during charging.	U	A	1	0	0	1023	a–1	–
			3-7	0-7	–	–	–	–	–	–	–	–	–	–
700	100	8	0	0-7	EV manufacturer code	Number assigned for each EV manufacturer using the option code.	–		1		0	255		–
			1-7	0-7	Option code	Data area exchanged between EV supply equipment and EV for specific control or function defined by the EV manufacturer	–	–	–	–	–	–		–

Key

DLC: Data length code

U: Unsigned

LSB: Least significant bit

Table A-3 Exchanged Parameter during DC Charging Control Process from System a Station to Vehicle

(*Clause* 4)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table 1	Status Flag
108	100	8	0	0-7	Identifier of welding detection	Identifier indicating whether or not the station deals with EV contactor welding detection	–	–	1		0	255	h-2	0: not supporting vehicle welding detection 1 or more: supporting vehicle welding detection
			1	0-7	Available output voltage	Maximum output voltage value at the vehicle connector terminals	U	V	1		0	1200	a-3	–
			2	0-7										
			3	0-7	Available output current	Maximum output current value of the station	U	A	1		0	255	a-4	–
			4	0-7	Threshold voltage	Threshold voltage to stop the charging process in order to protect vehicle battery	U	V	1		0	1200	b-2	–
			5	0-7										
			6-7	0-7	–	–	–	–	–	–	–	–	–	–
109	100	8	0	0-7	Control protocol number	Software version number of control protocol or charging sequences that the station deals with	U	–	1		0	255	b-1	–
			1	0-7	Output voltage	Supply voltage value of the output circuit in the station	U	V	1	0	0	1200	b-1	–
			2	0-7										
			3	0-7	Output current	Supply current value of the output circuit in the station	U	A	1	0	0	255	b-1	–
			4	0-7	–	–	–	–	–	–	–	–	–	–

Table A-3 (*Continued*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table 1	Status Flag
109	100	8	5	0	Station status	Status flag indicating the energy transfer from the station	–	–	1	0	0	1	c h-1	0: standby 1: charging
				1	Station malfunction	Status flag indicating whether or not there is a malfunction caused by the station	–	–	1	0	0	1	c h-1	0: normal 1: fault
				2	Energizing state	Status flag indicating a state in which voltage can be applied from the station or a state in which output charging is permitted	–	–	1	0	0	1	c h-1	0: disable 1: enable
				3	Battery incompatibility	Status flag indicating the compatibility of vehicle battery with the output voltage of station	–	–	1	0	0	1	c h-1	0: compatible 1: incompatible
				4	Charging system error	Status flag indicating whether or not there is a problem with EV, such as improper connection	–	–	1	0	0	1	d	0: normal 1: malfunction
				5	Charging stop control	Status flag indicating whether or not the station proceeds with shutdown process	–	–	1	0	0	1	e	0: operating, 1: shutdown or stop charging
				6-7	–	–	–	–	–	–	–	–	–	–
			6	0-7	Remaining charging time (counted by 10 s)	Remaining time before the end of charging (counted by 10 s)	U	s	10		0	2540	b-1	–
			7	0-7	Remaining charging time (counted by min)	Remaining time before the end of charging (counted by min)	U	min	1		0	255	b-1	–

Table A-3 (*Continued*)

Optional parameters														
ID (H')	**Period (ms)**	**DLC**	**Byte**	**Bit**	**Parameter**	**Content**	**Signed or Unsigned**	**Unit**	**LSB**	**Initial**	**Min**	**Max**	**Item in Table 1**	**Status flag**
118	100	8	0	1	High current control	Flag indicating station that is compatible with high current control.	–		1	0	0	1		0: Incompatible 1: compatible
				2	High voltage control	Flag indicating station that is compatible with high voltage control.	–		1	0	0	1		0: Incompatible 1: compatible
			0	0	Dynamic control	Flag indicating station that is compatible with dynamic control.	–		1	0	0	1		0: Incompatible 1: Compatible
			1-2	0-7	Available output current (extended)	Maximum output current value of the station	U	A	1	0	0	1023	a-4	
			3-4	0-7	Present charging current (extended)	Measured current value of the output circuit in the station	U	A	1	0	0	1023	a-4	
			5	0	Operating condition	A flag indicating operating condition of a station.	–		1	0	0	1		0: Standard 1: Specific
				1	Cooling function (for charging cable)	A flag indicating the charging cable is compatible with the cooling function which retains the temperature rise of the charging cable	–		1	0	0	1		0: Not operated 1: Operating
				2	Current limiting function (for charging cable)	A flag indicating the charging cable is compatible with a function which retains the charging current based on measured result of surface temperature of the charging cable	–		1	0	0	1		0: Not installed 1: Installed
				3	Cooling function (for charging connector)	A flag indicating the charging connector is compatible with the cooling function which retains temperature rise of the charging connector	–		1	0	0	1		0: Not operated 1: Operating

Table A-3 (*Concluded*)

Optional parameters

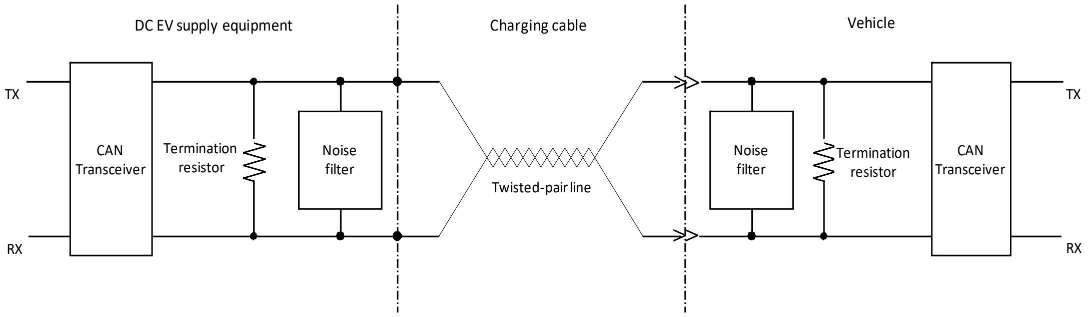
ID (H’)	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table 1	Status flag
118	100	8		4	Current limiting function (for charging connector)	A flag indicating the charging connector is compatible with the function which retains charging current based on measured result of terminal temperature of the charging connector	–		1	0	0	1		0: Not installed 1: Installed
				5	Over-temperature protection (for charging connector)	A flag indicating the charging connector is compatible with the function of over-temperature protection of the charging connector	–		1	0	0	1		0: Not installed 1: Installed
				6	Functional safety	A flag indicating the charging cable and the charging connector are compatible with functional safety	–		1	0	0	1		0: Not applied 1: Applied
708	100	8	0	0-7	EV manufacturer code	The EV supply equipment shall set the EV manufacture code as communicated by the EV (H’700.0)’	–		1		0	255		–
			1-7	0-7	Option code	Defined by EV manufacturers and EVSE manufacturers	–	–	–	–	–	–		–

Key

DLC: Data length code

U: Unsigned

LSB: Least significant bit



Key

TX	transmitter
RX	receiver

FIG. A-2 CAN COMMUNICATION CIRCUIT

A-5 PHYSICAL/DATA LINK LAYER

A-5.1 Communication Circuit

A data communication circuit for CAN communication shall be equipped to exchange parameters for charging control. It shall facilitate one-on-one communication between the vehicle and the DC EV supply equipment.

A-5.2 Terminating Resistor

The CAN communication circuit shall be equipped with a terminating resistor (nominal resistance: 120 Ω, its tolerance in compliance with ISO 11898-2).

A-5.3 Noise Filter

The CAN communication circuit shall be equipped with separate noise filters to reduce conducted noise in common mode and differential mode.

A-5.4 CAN Transceiver

The CAN communication circuit shall be equipped with CAN transceiver which is in compliance with ISO 11898.

A-5.5 Twisted-pair Line

Twisted pair line shall be used as the communication line that links the DC EV supply equipment with the vehicle so as to reduce differential mode noise.

A-5.6 Overvoltage Protection for the CAN Communication Circuit

A means of overvoltage protection, such as surge protective devices and zener diode, may be added to the CAN communication circuit.

A-5.7 Communication Protocol

The physical/data link layer specifications are shown in Table A-4.

Table A-4 The Physical Link Layer Specification for System A

(*Clause* A-5.7)

Specification of Communication Control Item	Requirements
Communication standard	ISO 11898-1, ISO 11898-2
Protocol	CAN 2.0 B Active
Format	Standard format: ID length 11 bits Extended format: not used
Communication speed	500 kbps
Bit sample point	72.5 percent to 87.5 percent

A-5.8 CAN Bus

The DC EV supply equipment and vehicle shall be equipped with a dedicated CAN communication circuit which is independent from each unique network and shall perform the charging control defined in this specification.

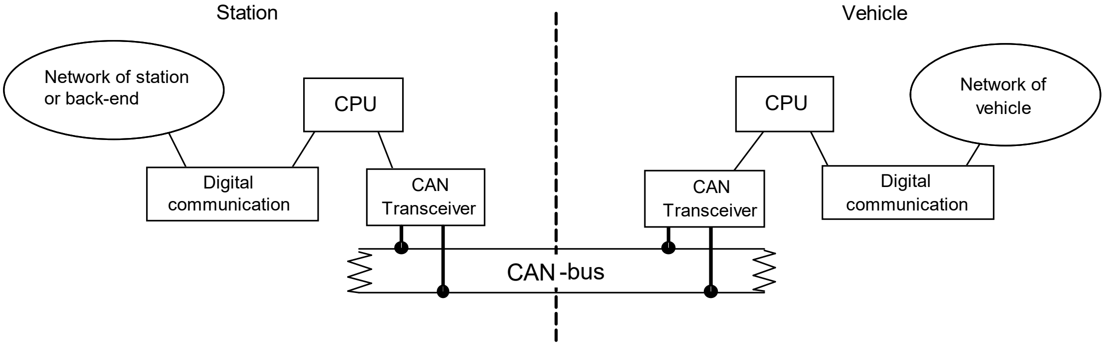
A-5.9 Transmission Process

The DC EV supply equipment and vehicle shall meet the requirements in Table A-5.

Table A-5 Specification of Data Transmission

(*Clause* A-5.9)

Item		Requirements
Transmission order	Data frame	ID shall be sent in the ascending order.
	Data byte	Byte shall be sent in the ascending order from 0 byte.
	Data bit	Bit shall be sent in the descending order from MSB.
Synchronization		Synchronization during the transmission cycle is unnecessary.
Transmission cycle		100 ms ± 10 [percent] (*see* Fig. A-4)



Key

CPU	Central processing unit

FIG. A-3 CAN BUS

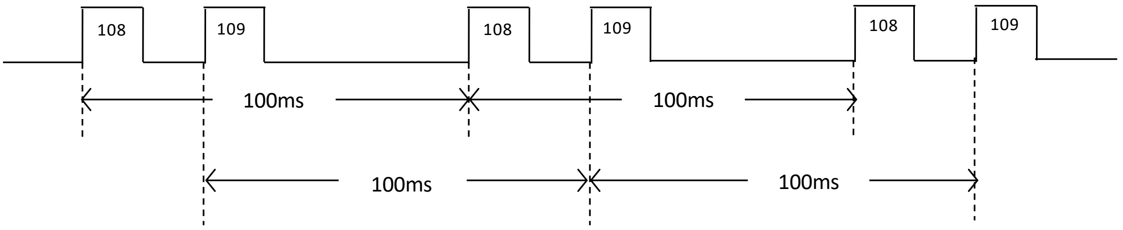


FIG. A-4 TRANSMISSION CYCLE

A-5.10 CAN Reception Error

After the establishment of CAN communication, the DC EV supply equipment shall stop charging if the data frames cannot be received for 1 s or more.

Any IDs can be used for detecting the non-reception of data frames. The value of the most recently-received normal data shall be used while the non-reception of data frames continues.

However, the following cases are not interpreted as a reception error:

a) incorrect ID order (when data frames are not received in the ascending order;

b) out of the transmission cycle (when the transmission cycle deviates beyond the margin of 10 percent from 100 ms; and

c) reception of other than data area.

A-6 BI-DIRECTIONAL POWER FLOW

A-6.1 Digital Communication Actions During Charging/Discharging Control Process

The communication actions and parameters according to the charging/discharging control process as defined in Table 38 of IS 17017 (Part 23) : 2021 are shown in Table A-6.

A-6.2 Digital Communication of DC Charging/ Discharging Control

The parameters for digital communication of DC charging/discharging control shall be exchanged according to the sequence diagram as shown in Fig. A-5.

A-6.3 Parameter Definition

The definition of parameters during DC charging/discharging control process are shown in Table A-7 and Table A-8.

Table A-6 Communication Actions and Parameters During DC Charging/Discharging Control Process between System A and Vehicle

(*Clause* A-6.1)

Charging/Discharging Control Stage		**State**	**High Level Action at System level** [a]	**Digital Communication Action**	**Parameter**	
					From DC EV Charging/Discharging Station	From Vehicle
Initialization	Handshaking	BDC-A	Vehicle unconnected	None	N/A	N/A
		BDC-B1	Connector plugged in	None	N/A	N/A
		BDC-B1	Wake up of DCCDCF and VCDCF	None	None	(default CAN)
			Communication data initialization	Preparation for digital communication	(default CAN)	(default CAN)
		BDC-B1→BDC-B2	Communication established, parameters exchanged, and compatibility checked	Exchange of charging control parameters	– Control protocol number – Available input/output voltage – Available input/output current – Battery incompatibility	– Control protocol number – Rated capacity of battery – Maximum/minimum battery voltage – Maximum charging time – Target battery voltage – Vehicle charging enabled
	Charge/discharge preparation	BDC-B2 →BDC-B3	Connector latched	Notification of connector latch status	– Vehicle connector latch	None
		BDC-B3	Insulation check for DC power line	None	Charging/discharging system malfunction	None

Table A-6 (*Concluded*)

Charging/Discharge Control Stage	State	High Level Action at System Level[a]	Digital Communication Action	Parameter	
				From DC EV Charging/Discharging Station	From Vehicle
Energy transfer	BDC-C or BDC-D	Vehicle side contactors closed	Notification of vehicle main contactor closed status	None	None
	BDC-C or BDC-D	Pre-charge	N/A	N/A	N/A
	BDC-C or BDC-D	Charging/discharging by the maximum available current of the vehicle battery (for MCC)	Notification of limit value of charging/discharging current (or voltage)	– Station status – Input/output voltage – Input/output current – Remaining charging time (sent, but not effective) – Station malfunction – Charging/discharging system malfunction	– Charging/discharging current limit – Charging/discharging system fault – Parking status of the vehicle
	BDC-C or BDC-D	Charging by voltage demand (for CVC) or discharging by the minimum allowable voltage of the vehicle battery (for MVC)	N/A	N/A	N/A
	BDC-C,(D) →BDC-B'1	Current suppression	Request of energy transfer shut-off	– Station status – Charging/discharging stop control – Input/output voltage – Input/output current	Vehicle charging/discharging enabled
Shutdown	BDC-B'1	Zero current confirmed	Notification of energy transfer shut-off	– Station status – Charging/discharging system malfunction	
	BDC-B'1→ BDC-B'2	Welding detection (by vehicle)		None	None
	BDC-B'2	Vehicle side contactors open	None	None	None
	BDC-B'2	DC power line voltage verification	Notification of present voltage	– Input/output voltage	None
	BDC-B'3	Connector may be unlatched	Notification of connector unlatched status (if required)	– Vehicle connector latch	None
	BDC-B'4	End of charge/discharge at communication level	Terminate the digital communication	None	None
	BDC-A	Connector unplugged		N/A	N/A

[a] The order of actions does not refer to the procedure of charging/discharging control process.

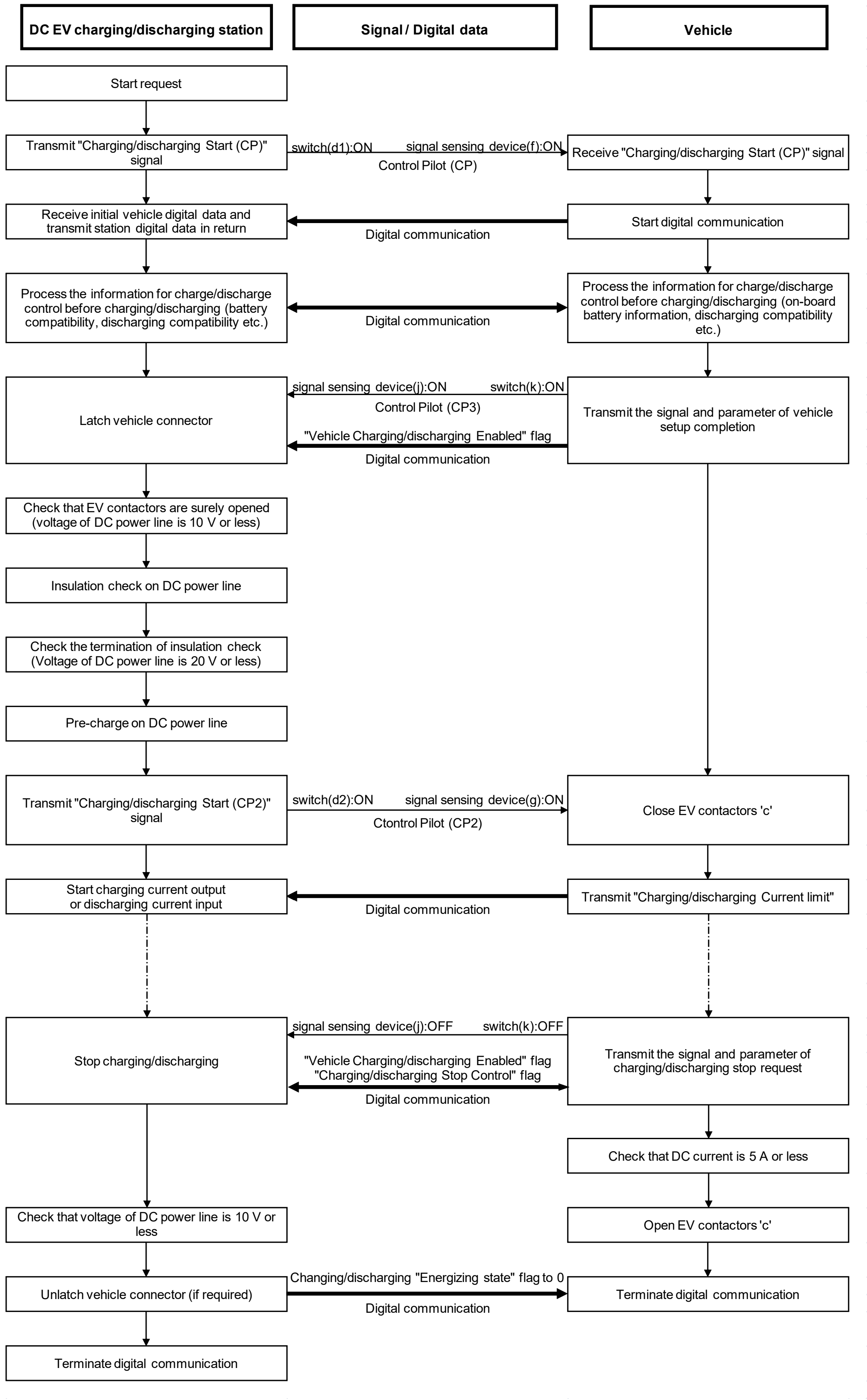

DC EV charging/discharging station
Signal / Digital data
Vehicle
Start request
Transmit "Charging/discharging Start (CP)" signal
switch(d1):ON
signal sensing device(f):ON
Control Pilot (CP)
Receive "Charging/discharging Start (CP)" signal
Receive initial vehicle digital data and transmit station digital data in return
Digital communication
Start digital communication
Process the information for charge/discharge control before charging/discharging (battery compatibility, discharging compatibility etc.)
Digital communication
Process the information for charge/discharge control before charging/discharging (on-board battery information, discharging compatibility etc.)
Latch vehicle connector
signal sensing device(j):ON
switch(k):ON
Control Pilot (CP3)
"Vehicle Charging/discharging Enabled" flag
Digital communication
Transmit the signal and parameter of vehicle setup completion
Check that EV contactors are surely opened (voltage of DC power line is 10 V or less)
Insulation check on DC power line
Check the termination of insulation check (Voltage of DC power line is 20 V or less)
Pre-charge on DC power line
Transmit "Charging/discharging Start (CP2)" signal
switch(d2):ON
signal sensing device(g):ON
Ctontrol Pilot (CP2)
Close EV contactors 'c'
Start charging current output or discharging current input
Digital communication
Transmit "Charging/discharging Current limit"
Stop charging/discharging
signal sensing device(j):OFF
switch(k):OFF
"Vehicle Charging/discharging Enabled" flag
"Charging/discharging Stop Control" flag
Digital communication
Transmit the signal and parameter of charging/discharging stop request
Check that DC current is 5 A or less
Check that voltage of DC power line is 10 V or less
Open EV contactors 'c'
Unlatch vehicle connector (if required)
Changing/discharging "Energizing state" flag to 0
Digital communication
Terminate digital communication
Terminate digital communication

FIG. A-5 SEQUENCE DIAGRAM OF DC CHARGING/DISCHARGING CONTROL COMMUNICATION FOR SYSTEM A

Table A.7 Exchanged Parameter during DC Charging/Discharging Control Process from Vehicle to System A Station

(*Clause* A-6.3)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
100	100	8	0	0-7	Minimum charging current	Minimum current necessary for charging without depleting the high-voltage traction battery, considering the power consumption of the vehicle accessories	U	A	1	0	0	254	a'-1	–
			1-3	0-7	–	–	–	–	–	–	–	–	–	–
			4	0-7	Maximum battery voltage	The maximum voltage value at the vehicle inlet terminals, at which the station stops charging to protect the vehicle battery	U	V	1		0	1200	b'-2	–
			5	0-7										
			6	0-7	Constant of charging rate indication	Fixed value for charging rate indication, which is the maximum charging rate (100 percent) of vehicle battery	U	—	1	100	0	255	b'-2	–
			7	0-7	–	–	–	–	–	–	–	–	–	–
101	100	8	0	0-7	–	–	–	–	–	–	–	–	–	–
			1	0-7	Maximum charging time (set by 10 s)	Maximum charging time permitted by EV, set by 10 s (sent, but not effective)	U	s	10	0	0	2540	b'-2	–
			2	0-7	Maximum charging time (set by 1min)	Maximum charging time permitted by EV, set by minute (sent, but not effective)	U	min	1	0	0	255	b'-2	–
			3	0-7	Estimated charging time (set by 1min)	Estimated remaining time before the end of charging calculated by EV, set by minute (sent, but not effective)	U	min	1		0	254	b'-2	–
			4	0-7	–	–	–	–	–	–	–	–	–	–
			5	0-7	Rated capacity of battery	Rated capacity of battery	U	kWh	0.1		0	6553.5	b'-2	–
			6											
			7	0-7	–	–	–	–	–	–	–	–	–	–

Table A-7 (*Continued*)

ID (H’)	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
102	100	8	0	0-7	Control protocol number	Software version of control sequence to which EV corresponds	U	–	1		0	255	b’-1	–
			1	0-7	Target battery voltage for charging	Targeted charging voltage at the vehicle inlet terminals	U	V	1		0	1200	b’-1	–
			2	0-7										
			3	0-7	Maximum available current for charging	Current value limited by the EV during charging	U	A	1	0	0	255	a’-1	–
			4	0	Battery overvoltage	Status flag indicating whether or not the vehicle battery voltage exceeds the maximum limit specified by EV	–	–	1	0	0	1	g’	0: normal 1: fault
				1	Battery undervoltage	Status flag indicating whether or not the vehicle battery voltage is less than the lower limit specified by EV	–	–	1	0	0	1	g’	0: normal 1: fault
				2	Battery overcurrent	Status flag indicating whether or not the input/output current exceeds the EV limited current	–	–	1	0	0	1	g’	0: normal 1: fault
				3	High battery temperature	Status flag indicating whether or not the temperature of vehicle battery exceeds the maximum limit	–	–	1	0	0	1	g’	0: normal 1: fault
				4	Battery voltage deviation error	Status flag indicating whether or not the vehicle battery voltage deviates from the output voltage measured by the station	–	–	1	0	0	1	g’	0: normal 1: fault
				5-7	–	–	–	–	–	–	–	–	–	–

Table A-7 (*Continued*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
102	100	8	5	0	Vehicle charging/discharging enabled	Status flag indicating charge/discharge permission status of EV	–	–	1	0	0	1	g'	0: disabled 1: enabled
				1	Parking status of the vehicle	Status flag indicating the parking status of the vehicle	–	–	1	0	0	1	g'	0: vehicle in parking position 1: vehicle not in parking position
				2	Charging/discharging system fault	Status flag indicating a malfunction caused by EV or the station, and detected by EV	–	–	1	0	0	1	g'	0: normal 1: fault
				3	Vehicle status	Status flag indicating the EV contactor status	–	–	1	1	0	1	g'	0: EV contactor closed or during welding detection 1: EV contactor open or welding detection finished
				4	Normal stop request before charging/discharging	Status flag indicating the request of EV to stop charging/discharging control	–	–	1	0	0	1	g'	0: no request 1: request to stop
				5-6	–	–	–	–	–	–	–	–	–	–
				7	Vehicle discharge compatibility flag	Status flag indicating discharge compatibility of the EV	–	–	1	1	0	1	b'-1	0: incompatible 1: compatible
			6	0-7	Charging rate	Charging rate of battery	U	%	1		0	100	a'-1	–
			7	0-7	–	–	–	–	–	–	–	–	–	–

Table A-7 (*Concluded*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
200[a]	100	8	0	0-7	Maximum available current for discharging	Current value limited by EV during discharging (offset: –255)	U	A	1	0	-255	0	a'-1	–
			1-3	0-7	–	–	–	–	–	–	–	–	–	–
			4	0-7	Target battery voltage for discharging	Targeted discharging voltage at the vehicle inlet terminals	U	V	1		0	1200	b'-1	–
			5	0-7										
			6	0-7	Minimum charging rate	Minimum charging rate of the EV battery limited by the EV during discharging	U	%	1		0	100	b'-3	–
			7	0-7	Maximum charging rate (optional)	Maximum charging rate of the EV battery limited by the EV during charging	U	%	1		0	100	b'-3	–
201	100	8	0	0-7	Control sequence number of charging/discharging	Software version of control sequence to which EV corresponds	U	–	1		0	255	b'-1	–
			1	0-7	Estimated discharging time (optional)	Estimated remaining time before the end of discharging calculated by the EV for only display	U	min	1		0	65534	b'-2	–
			2	0-7										
			3	0-7	Available vehicle energy (optional)	Available energy value (including fuel battery and/or power generated by gasoline, etc) supplied by the EV for only display	U	kWh	0.1		0	6553.4	b'-2	–
			4	0-7										
			5-7	0-7	–	–	–	–	–	–	–	–	–	–

[a] For ID109, from the station to the vehicle, see Table A-8.

Table A-8 Exchanged Parameter during DC Charging/Discharging Control Process from System A Station to Vehicle

ID (H’)	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
108	100	8	0	0-7	EV contactor welding detection support identifier	Identifier indicating whether or not the station deals with EV contactor welding detection	–	–	1		0	255	h’-2	0: not supporting vehicle welding detection 1 or more: supporting vehicle welding detection
			1	0-7	Available output voltage	Maximum output voltage value at the vehicle connector terminals	U	V	1		0	1200	a’-3	–
			2	0-7										
			3	0-7	Available output current	Maximum output current value of the station	U	A	1		0	255	a’-4	–
			4	0-7	Threshold voltage for charging	Threshold voltage to stop the charging process in order to protect vehicle battery	U	V	1		0	1200	b’-2	–
			5	0-7										
			6-7	0-7	–	–	–	–	–	–	–	–	–	–
109	100	8	0	0-7	Control protocol number	Software version number of control protocol or charging sequences that the station deals with	U	–	1		0	255	b’-1	–
			1	0-7	Output voltage	Supply voltage value of the output circuit in the station	U	V	1	0	0	1200	b’-1	–
			2	0-7										
			3	0-7	Output current	Supply current value of the output circuit in the station	U	A	1	0	0	255	b’-1	–
			4	0	Station discharge compatibility flag	Status flag indicating discharge compatibility of the station	–	–	1	0	0	1	b’-1	0: incompatible1: compatible
				1-7	–	–	–	–	–	–	–	–	–	–

Table A-8 (*Continued*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signedor Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
109	100	8	5	0	Station status	Status flag indicating the energy transfer from the station	–	–	1	0	0	1	c' h'-1	0: standby 1:charging/ discharging
				1	Station malfunction	Status flag indicating whether or not there is a malfunction caused by the station	–	–	1	0	0	1	c' h'-1	0: normal 1: fault
				2	Vehicle connector latch	Status flag indicating the electromagnetic latch status of vehicle connector	–	–	1	0	0	1	c' h'-1	0: unlocked 1: locked
				3	Battery incompatibility	Status flag indicating the compatibility of vehicle battery with the output voltage of station	–	–	1	0	0	1	c' h'-1	0: compatible 1: incompatible
				4	Charging/discharging system malfunction	Status flag indicating whether or not there is a problem with EV, such as improper connection	–	–	1	0	0	1	d'	0: normal 1: malfunction
				5	Charge/discharge stop control	Status flag indicating whether or not the station proceeds with shutdown process	–	–	1	0	0	1	e'	0: operating 1: shutdown or stop charging/discharging
				6-7	–	–	–	–	–	–	–	–	–	–
			6	0-7	Remaining charging time (counted by 10 s)	Remaining time before the end of charging (counted by 10 s)	U	s	10		0	2540	b'-1	–
			7	0-7	Remaining charging time (counted by min)	Remaining time before the end of charging (counted by min)	U	min	1		0	255	b'-1	–

Table A-8 (*Concluded*)

ID (H')	Period (ms)	DLC	Byte	Bit	Parameter	Content	Signed or Unsigned	Unit	LSB	Initial	Min	Max	Item in Table A-9	Status flag
208[a]	100	8	0	0-7	Input current	Draw current value of the input circuit in the station (offset:-255)	U	A	1	0	-255	0	b'-1	–
			1	0-7	Available input voltage	Minimum input voltage value at the vehicle connector terminals	U	V	1		0	1200	a'-3	–
			2	0-7										
			3	0-7	Available input current	Minimum input current value of the station (offset:-255)	U	A	1		-255	0	a'-4	–
			4-5	0-7	–	–	–	–	–	–	–	–	–	–
			6	0-7	Threshold voltage for discharging	Threshold voltage to stop the discharging process in order to protect vehicle battery	U	V	1		0	1200	b'-2	–
			7	0-7										
209	100	8	0	0-7	Control sequence number of charging/discharging	Software version number of control sequence or charging/discharging sequences that the station deals with	U	–	1		0	255	b'-1	–
			1	0-7	Remaining discharging time	Remaining time before the end of discharging	U	min	1		0	65534	b'-1	–
			2	0-7										
			3-7	0-7	–	–	–	–	–	–	–	–	–	–

[a] For ID200 and ID201, from the vehicle to the station, see Table A-7.

A-6.4 Charging/Discharging Control Process

The charging/discharging control process shall be in accordance with **A-6.3** of IS 17017 (Part 23) : 2021.

A-6.5 Exchanged Information for DC Charging/Discharging Control

This clause describes information which shall be exchanged between a DC EV charging/discharging station and a vehicle during the charging/discharging process according to IS 17017 (Part 23) : 2021. Table A-9 shows exchanged information for DC charging/discharging control.

Table A-9 Exchanged Information for DC Charging/Discharging Control

(*Clause* A-6.5)

Sl No.	Information	Description	Relevant Requirement in IS 17017 (Part 23)
a’-1	Current limit for the maximum current control (MCC) system	Exchange of current value limited by EV	**A-6.3.4**
a’-3	Maximum/minimum rated voltage of the DC EV charging/discharging station	Exchange of maximum/minimum rated voltage value of DC EV charging/discharging station	**6.3.1.101** **6.3.1.104** **6.3.1.106**
a’-4	Maximum rated current of the DC EV charging/discharging station	Exchange of maximum rated current value of DC EV charging/discharging station	**6.3.1.101** **6.3.1.104**
b’-1	Communication protocol	Exchange of software version of a charging/discharging system	**6.3.1.104** **A-7.1**
b’-2	Maximum/minimum voltage limit of the EV	Exchange of maximum/minimum voltage limit value of vehicle.	
b’-3	Maximum/minimum charging rate limit of the EV battery	Exchange of maximum/minimum charging rate limit value of the vehicle battery.	
c’	Insulation check result	Exchange of the result of insulation check before charging/discharging - If insulation check fails, a signal is sent that charging/discharging is not allowed.	**6.3.1.105**
d’	Short circuit test before charging/ discharging	Exchange of information on short circuit test before charging/discharging	**6.3.1.109**
e’	Charging/discharging stopped by user	Exchange of information on charge/discharge stop command by the user of DC EV charging/ discharging station	**6.3.1.110**
f’	DC EV charging/discharging station real time available load current (optional)	Exchange of DC EV charging/discharging station real time available load current for demand management. Required for system providing that function.	**6.3.2.102**
g’	Loss of digital communication	Detection of loss of digital communication - If a receiver does not get information expected to receive within time out period, it is considered as loss of digital communication.	**A-3.2**
h’-1	Zero current confirmed	Notification of zero current confirmed - Station informs EV that low current condition has been met (to allow the opening and welding check of EV contactors by EV)	**F-1.3.4**
h’-2	Welding detection	Exchange of information on the whole process of welding detection	
I‘-1	Normal shutdown	Termination of the charging process not caused by a failure	**6.3.1.115**
I‘-2	Error shutdown	Termination of the charging process caused by a failure	**6.3.1.116**

ANNEX C

(*normative*)

DIGITAL COMMUNICATION FOR CONTROL OF DC CHARGING SYSTEM C (COMBINED SYSTEM)

C-1 GENERAL

The digital communication for the DC EV supply equipment of system C as specified in Annex B of IS 17017 (Part 23) : 2021 is defined in the following standards: DIN 70121, IS/ISO 15118-1, IS/ISO 15118-2 and IS/ISO 15118-3.

Systems implementing these specifications incorporate the following features:

a) security concept including encryption, signing, key management, etc.;
b) robust PLC-based communications;
c) automatic address assigning and association;
d) IPv6-based communications;
e) compressed XML messages;
f) client-server approach;
g) safety concept including cable check, welding detection, etc.; and
h) extension concept for added-value services.

C-2 REQUIRED EXCHANGE PARAMETERS

The parameters to be exchanged for DC charging control are shown in Table C-1, corresponding to Table 1. Additional parameters can be found in DIN SPEC 70121 and IS/ISO 15118-2.

Table C-1 Required Exchanged Parameters for DC Charging Control for System C

(*Clause* C-2 *and Table* 1)

Item in Table 1	Information	Parameter Name (IS/ISO 15118-2 : 2014)
a-1	Current request for the controlled current charging (CCC) system	CurrentDemand Req/EV Target Current
a-2	Voltage request for the controlled voltage charging (CVC) system	Current Demand Req/EVT arget Voltage
a-3	Maximum rated voltage of DC EV supply equipment	Current Demand Res/EVSE Maximum Voltage Limit
a-4	Maximum rated current of DC EV supply equipment	Current Demand Res/EVSE Maximum Current Limit
b-1	Communication protocol	supported App Protocol {Req,Res}
b-2	Maximum voltage limit of EV	Current Demand Req/EV MaximumVoltage Limit
b-3	EV minimum current limit, only for the controlled voltage charging (CVC) system	Charge Parameter DiscoveryRes/DC_EVSE Charge Parameter/EVSE Minimum Current Limit
c	Insulation check result	{Power Delivery Res, Cable Check Res, Pre Charge Res, Current Demand Res, Welding Detection Res}/DC_EVSE Status / EVSEIsolationStatus
d	Short circuit test before charging	CableCheck{Req,Res}
e	Charging stopped by user	{Charge Parameter Discovery Res, Powe rDelivery Res, Cable Check Res, PreCharge Res, Current Demand Res, Welding Detection Res}/DC_EVSE Status/EVSE Status Code/EVSE_Shutdown {Charge Parameter Discovery Res, Power Delivery Res, Cable Check Res, PreChargeRes, Current Demand Res, Welding Detection Res}/ DC_EVSE Status/EVSE Notification/Stop Charging
f	EV supply equipment real time available load current (optional)	Current Demand Res/EVSE Maximum Current Limit
g	Loss of digital communication	Message timers Control pilot state
h-1	Zero current confirmed	Power Delivery Res/ResponseCode Current Demand Res/EVSE Present Current
h-2	Welding detection	WeldingDetection{Req, Res}

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Electrotechnology in Mobility Sectional Committee, ETD 51

Organization	*Representative(s)*
Department of Science and Technology, New Delhi	Shri Sajid Mubashir (***Chairman***)
Ashok Leyland Limited, Chennai	Dr Shankar Akella Shri Srinivas S. (*Alternate* I) Shri Huzefa A. C. (*Alternate* II)
Ather Energy Private Limited, Bengaluru	Shri Swapnil Jain Shri Nishant D. K. (*Alternate*)
Autogrid India Private Limited, Bengaluru	Shri Vish Ganti
Automotive Component Manufactures Association of India, New Delhi	Shri Uday Harite Ms Pooja Sharma (*Alternate*)
Bajaj Auto Limited, Pune	Dr Philip Jose Shri Arvind V. Kumbhar (*Alternate*) Shri Adish Aggarwal (*Young Professional*)
Bosch Limited, Bengaluru	Shri Pradeep Ramachandra Shri Hariprasad Gowrisankar (*Alternate* I) Shri Sanjay Khatri (*Alternate* II) Ms Veena Koodli (*Alternate* III)
CG Power and Industrial Solutions, Mumbai	Shri A. Sudhakaran Shri Sandeep R. Bachkar (*Alternate*)
CSIR - National Physical Laboratory, New Delhi	Shri R. P. Aloysius Ms Priyanka Jain (*Alternate*) Shri Atul Suresh Somkuwar (*Young Professional*)
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Central Power Research Institute, Bengaluru	Shri Kuldeep Sing Rana
Delta Electronics India Private Limited, Haryana	Shri Rohit Dalal Shri Shashank Narayan (*Alternate*)
Denso International India Private Limited, Gurugram	Shri Alok Kumar Ms Alka Sharma (*Alternate*)
Department of Science and Technology, New Mehrauli Road, New Delhi	Shri Suresh Babu
Dialogue and Development Commission of Delhi, Delhi	Shri Ashok Kumar Jha
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Expert in Individual Capacity	Shri P. K. Mukherjee
Fortum India Private Limited, Gurugram	Shri Awadhesh Kumar Jha Shri Chinmay Shukla (*Alternate* I) Shri Ankit Maheshwari (*Alternate* II)

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Indian Institute of Technology Madras, Chennai	Dr Prabhjot Kaur Ms Anitha Dhianeshwar (*Alternate*)
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International Copper Association India, Mumbai	Shri Debdas Goswami Shri Mayur Karmakar (*Alternate*)
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Siemens Limited, Mumbai	Shri Bidyut Mazumder Shri Amit Kekare (*Alternate*)
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The Energy and Resources Institute, New Delhi	Shri Alekhya Datta Dr Shashank Vyas (*Alternate* I) Shri Neshwin Rodrigues (*Alternate* II)
Toyota Kirloskar Motor Private Limited, Bidadi	Shri Channappa Revadi Shri Raju. M (*Alternate* I) Shri M. Suchindran (*Alternate* II)
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Valeo India Private Limited, Chennai	Shri Vivek Murali
Vision Mechatronics Private Limited	Dr Rashi Gupta Shri Bharat Gupta (*Alternate*)
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Member Secretary

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Scientist ‘C’ (ETD), BIS

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